Development and Application of Hyperspectral Infrared Ozone Retrieval Products for Operational Meteorology

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Cyclogenesis is a key forecast challenge at operational forecasting centers such as WPC and OPC, so these centers have a particular interest in unique products that can identify key storm features. In some cases, explosively developing extratropical cyclones can produce hurricane force, non-convective winds along the East Coast and north Atlantic as well as the Pacific Ocean, with the potential to cause significant damage to life and property. Therefore, anticipating cyclogenesis for these types of storms is crucial for furthering the NOAA goal of a "Weather Ready Nation". Over the last few years, multispectral imagery (i.e. RGB) products have gained popularity among forecasters. The GOES-R satellite champion at WPC/OPC has regularly evaluated the Air Mass RGB products from GOES Sounder, MODIS, and SEVIRI to aid in forecasting cyclogenesis as part of ongoing collaborations with SPoRT within the framework of the GOES-R Proving Ground. WPC/OPC has used these products to identify regions of stratospheric air associated with tropopause folds that can lead to cyclogenesis and hurricane force winds. RGB products combine multiple channels or channel differences into multi-color imagery in which different colors represent a particular cloud or air mass type. Initial interaction and feedback from forecasters evaluating the legacy Air Mass RGBs revealed some uncertainty regarding what physical processes the qualitative RGB products represent and color interpretation. To enhance forecaster confidence and interpretation of the Air Mass RGB, NASA SPoRT has transitioned a total column ozone product from AIRS retrievals to the WPC/OPC. The use of legacy AIRS demonstrates future JPSS capabilities possible with CrIS or OMPS. Since stratospheric air can be identified by anomalous potential vorticity and warm, dry, ozone-rich air, hyperspectral infrared sounder ozone products can be used in conjunction with the Air Mass RGB for identifying the role of stratospheric air in explosive cyclogenesis and hurricane force wind events. Currently, forecasters at WPC/OPC are evaluating the Air Mass RGB imagery in conjunction with the AIRS total column ozone to aid forecasting cyclogenesis and high wind forecasts. One of the limitations of the total ozone product is that it is difficult for forecasters to determine whether elevated ozone concentrations are related to stratospheric air or climatologically high values of ozone in certain regions. To address this limitation, SPoRT created an AIRS ozone anomaly product which calculates the percent of normal ozone based on a global stratospheric ozone mean climatology. With the knowledge that ozone values 125 percent of normal and greater typically represent stratospheric air; the anomaly product can be used with the total column ozone product to confirm regions of stratospheric air on the Air Mass RGB. This presentation describes the generation of these products along with forecaster feedback concerning the use of the AIRS ozone products in conjunction with the Air Mass RGB product for the unique forecast challenges WPC/OPC face. Additionally examples of CrIS ozone and anomaly products will be shown to further demonstrate the utility and capability of JPSS in forecasting unique events.